ENGLISH TRANSLATION OF ANNEXES

Claims

1. An automation system (1), comprising at least

- a bus system (2),
- I/O bus subscribers (31 - 38) connected to it and a standard control device (4; 40, 41), as well as
- at least one safety analyzer (5, 5, 5´´) which monitors the data flow via the bus system and is designed to carry out at least one safety-related function,

characterized in that

the safety analyzer is set up for checking and processing safety-related data in the bus datastream and/or has a device for manipulating the datastream transmitted on the bus (2).

2. The automation system (1) as claimed in claim 1,

characterized in that

the standard control device controls at least one safety-related Output.

3. The automation system (1) as claimed in claim 1 or 2,

characterized in that

the safety analyzer (5, 5´, 5´´) has a freely programmable logic device, which processes the monitored data, in particular the monitored safety-related data.

4. The automation system (1) as claimed in one of claims 1 to 3,

characterized in that

the safety analyzer (5, 5´, 5´´) is not a logic bus subscriber in the automation system (1) and has at least one safety-related output (6) via which at least one assembly, which is associated with the safety analyzer, of the automation system, in particular at least one bus subscriber (31 - 38), can be switched on or off.

5. The automation system (1) as claimed in claim 4, characterized in that
the safety analyzer (5, 5´, 5´´) is set up for switching off a safety island, a bus spur (8) and/or the entire system.

6. The automation system as claimed in one of claims 1 to 5,
characterized in that
the safety analyzer (5´) has at least one safety-related input (10), via which the safety analyzer is connected to a safety-related device (11) in the automation system for detecting safety-related data.

7. The automation system (1) as claimed in one of claims 1 to 6,
characterized in that
the bus system (2) is connected via an interface assembly (41) to a host (40), with the process-related control being arranged in the host, and the safety-related control being arranged in the interface assembly.

8. The automation system (1) as claimed in one of claims 1 to 7,
characterized in that

the bus (2) is a serial bus, and at least one safety analyzer (5, 5´) is arranged in the long-distance bus section of the automation system.

9. The automation system (1) as claimed in claim 8, characterized in that
a safety analyzer (5) is arranged directly after the host (40) or after the interface assembly (41).

10. The automation system (1) as claimed in one of claims 1 to 9,
characterized in that
a safety analyzer (5) is arranged in the interface assembly (41).

11. The automation system (1) as claimed in one of the preceding claims 1 to 10,
characterized in that
the safety analyzer (5, 5´, 5´´) comprises a memory device for storing a process map.

12. The automation system (1) as claimed in one of the preceding claims 1 to 11,
characterized in that
the safety analyzer (5, 5´, 5´´) has a device for manipulating the input and/or output data transmitted on the bus (2).

13. The automation system (1) as claimed in claim 12,
characterized in that
the device overwrites input and/or output data in the safety analyzer (5, 5´, 5´´), and/or inserts data into the datastream.

14. The automation system (1) as claimed in one of the preceding claims 1 to 13,

characterized in that

at least one safety analyzer (5, 5´, 5´´) is of redundant design.

15. A method for operating an automation system, in particular an automation system (1) as claimed in one of claims 1 to 14,

characterized in that

a standard control device (4; 40, 41) carries out a process control with the processing of process-linked I/O data and safety-related control with the processing of safety-related data, and, furthermore, processing of safety-related data is carried out in at least one safety analyzer (5, 5´, 5´´), with safety-related data, in particular safety-related logic linking data in the bus datastream, being processed in the safety analyzer.

16. The method as claimed in claim 15,

characterized in that

the standard control device controls at least one safety-related output.

17. The method as claimed in claim 15 or 16,

characterized in that

a comparison of the safety-related logic linking data, which is transmitted via the bus, for the standard control device (4, 41) and/or of at least one further safety analyzer (5, 5´, 5´´) with the corresponding logic linking data of the first safety analyzer, is carried out in a safety analyzer (5, 5´, 5´´).

18. The method as claimed in one of claims 15 to 17, characterized in that

the logic linking data, which is produced by the standard control (4, 41) and is sent as output data via the bus, is checked in at least one safety analyzer (5, 5´, 5´´) by modeling the safety-related logic links of the standard control (4, 41).

19. The method as claimed in one of claims 15 to 18, characterized in that

safety-related functions are carried out in response to the check or the comparison by the safety analyzer (5, 5´, 5´´).

20. The method as claimed in one of claims 15 to 19, characterized in that

a safety-related function is carried out via a safety-related output (6) of the safety analyzer (5, 5´, 5´´).

21. The method as claimed in one of claims 15 to 20, characterized in that

the safety analyzer carries out safety-related functions in response to the safety-related data detected via the safety-related input (10) of the safety analyzer (5´).

22. The method as claimed in claim 21, characterized in that

the process of carrying out the safety-related function comprises switching at least one assembly in the automation bus system, in particular a bus subscriber (32 - 38), on or off.

23. The method as claimed in one of claims 15 to 22, characterized in that
the safety analyzer (5´, 5´´) overwrites or deletes at least one data item in the datastream and/or inserts at least one data item into the bus datastream by means of a device for manipulating the datastream an the bus (2).

24. The method as claimed in claim 23, characterized in that
the safety analyzer (5, 5´, 5´´) at least partially stores the monitored datastream and copies input data in the bus datastreams to output data in the bus datastream, and vice versa.

25. The method as claimed in one of claims 15 to 24, characterized in that
safety-related data is transmitted via the bus (2) using a security protocol.

26. The method as claimed in claim 25, characterized in that,
in addition to the safety data item, the security protocol comprises the negated safety data item, a sequential number, an address and/or data protection information (CRC).

27. The method as claimed in one of claims 15 to 26, characterized in that
the bus is a system operating an the master-slave

principle, with data being transmitted between at least two slaves, in particular between individual bus subscribers (31 - 38), by means of a data link via at least one safety analyzer (5 5´, 5´´), with the safety analyzer copying data in the bus datastream.

28. The method as claimed in one of claims 15 to 27, characterized in that

the bus is a system operating on the master-slave principle, with data being transmitted between at least two slaves, in particular between individual bus subscribers (31 - 38), by means of a data link via the control or the master, with the control or the master copying data in the bus datastream.

29. The method as claimed in one of claims 15 to 28, characterized in that

quality data is produced by means of a safety analyzer (5, 5´, 5´´), and/or the data which has been read is prepared for further processing.

30. The method as claimed in one of claims 15 to 29, characterized in that

the safety-related logic links used in a safety analyzer (5´) are at least partially carried out in redundant form in at least one further safety analyzer (5´´), and the same safety functions are at least partially carried out by the two safety analyzers.

31. The method as claimed in one of claims 15 to 30, characterized in that

a safety analyzer also at least partially carries out process data processing.

Add a1